



Spokane International Airport

Rail-Truck Transload Facility Project

**BUILD FY2019 Grant Application
Spokane, Washington**

Appendix B: Benefit Cost Analysis

Executive Summary

The West Plains PDA has become an attraction for new large employers and economic generators within Spokane County. This regionally significant aerospace, logistics, and advanced manufacturing development benefits the City of Spokane, the Spokane International Airport, Spokane County, the City of Medical Lake, and the City of Airway Heights. The West Plains PDA has with intentional planning developed this rural area for commercial and industrial development and in recent years, there have been several applications to develop these lands.

A central and critical element of this development is the need to efficiently and effectively serve these new industries through the shipment for freight. The Rail-Truck Transload Facility will be the only facility of its kind in the West Plains Area. The Rail-Truck Transload Facility will establish an inland port and provide improved connectivity between the region and the national and international trade corridors that converge on Spokane. The period used to estimate benefits of the project is 20-years beginning in 2022 following completion of construction. The computed benefit-cost ratio for the Rail-Truck Transload Facility Project is 2.39 using a seven percent discount rate.

Methodology

This Benefit-Cost Analysis (BCA) was completed for the Spokane International Airport's (SIA) Rail-Truck Transload Facility Project and is based on the 2018 Benefit-Cost Analysis Guidance for Discretionary Grant Programs. It is important to note that a formal BCA is not a comprehensive measure of a project's total economic impact, as many benefits cannot be readily quantified or occur under conditions of uncertainty. However, to the maximum extent possible given available data, the formal BCA prepared in connection with this Rail-Truck Transload Facility grant application reflects quantifiable economic benefits. Economic value was estimated for the proposed transportation improvement project in terms of improvements to safety, economic competitiveness, environmental sustainability, decreased truck traffic, and reduced pollution benefits.

Project Overview

The project would extend an existing rail spur to a 4.4-acre paved rail loading facility. The project would include 3.2 miles of rail construction and a 0.2-mile vehicle access road to the site. The site would be located west of the City of Spokane at the Spokane International Airport in a rural area, as identified by the 2010 Census Urban Area Map, approximately 4 miles north of Interstate 90.

No-Build Baseline

The benefit cost analysis compares the Rail-Truck Transload Facility Project to a no-build scenario. The no-build scenario assumes that no other freight movement infrastructure would be built in the West Plains Development Area throughout the 20-year project life; that all freight would continue to be shipped and processed at the existing transload facility in downtown Spokane Valley; and that current economic factors would remain consistent through a 20-year life following construction of the project.

Assumptions

The BCA measures benefits against costs throughout a period of analysis beginning at the start of construction and including 20 years of operations.

The monetized benefits and costs are estimated in 2019 dollars with future dollars discounted in compliance with BUILD requirements using a 7 percent real rate, and sensitivity testing at 3 percent.

The methodology makes several important assumptions and seeks to avoid overestimation of

benefits and underestimation of costs. Specifically:

- Input prices are expressed in 2019 dollars;
- As a commercial facility, calculations are based on 261 work days per year;
- The period of analysis begins in 2021 and ends in 2041. It includes project development and construction years (2019 - 2021) and 20 years of operations (2022 - 2041);
- A constant 7 percent real discount rate is assumed throughout the period of analysis. A 3 percent real discount rate is used for sensitivity analysis;
- Opening year demand is an input to the BCA and is assumed to be fully realized in Year 1 (no ramp-up); and
- Unless specified otherwise, the results shown in this document correspond to the effects of the Full Build alternative.

Demand

Demand of the transload facility and subsequent impacts on truck traffic were estimated based on the capacity of the rail system upon completion of Phase 2 of the project as described above. The rail length available to load and unload trains at the transload facility will be 1,545-feet to accommodate (5) double stack well cars at 309 feet each. Double stack well cars each have 5 wells and each well can hold two containers so a single car holds ten containers, for a total of 50 cars per train. In reality, the facility will get a mix of cars of varying lengths, but the double stack well car is what the facility was primarily designed for. The facility will have three parallel tracks adjacent to the loading area and is anticipated to be able to accommodate two trains per day or a total of 100 rail cars.

For converting this demand into a reduction in truck traffic, it was assumed that each rail car would carry the equivalent of four trucks for a total impact of 400 trucks per day. As this assumption assumes full capacity of the facility upon completion of construction; a 0% growth rate was applied to impacted trucks over the life of the project. It is noted that expansion of the facility (Phase 3) based on growth and demand is planned and would significantly increase the benefits of the project however these benefits are not included in this analysis.

Net Benefits

A summary of the relevant data and calculations used to derive the benefits and costs of the project can be found in the .xlsx Benefit-Cost Analysis (BCA) spreadsheet. The \$16.9 million Rail-Truck Transload Facility Project will conservatively provide up to \$72.2 million in present worth economic benefits, see **Table 1**. This results in a benefit cost ratio of 4.22:1. In addition, the project will enhance property values, improve quality of life, and significantly promote the economic development of the region as a whole which are more difficult to quantify.

The benefits table shown below summarizes the quantifiable selection criteria for this project, the description, inputs, value and monetized value at a seven percent (7%) and three percent (3%) discount rates. Project costs, benefits and net present value are showcased in the table, followed by the benefit-cost ratio in the bottom row.

TABLE 1 - BENEFIT COST ANALYSIS SUMMARY			
BENEFITS	Present-Worth Value	7% Discount	3% Discount
Truck Travel Time	\$34,503,040	\$19,555,625	\$26,435,883
Fuel Savings	\$17,773,056	\$10,073,408	\$13,617,537
Emissions Reductions	\$3,682,755	\$2,082,625	\$2,818,733
Safety	\$7,214,681	\$3,788,929	\$5,344,679
Deferred Maintenance	\$9,066,096	\$5,138,480	\$6,946,352
TOTAL BENEFITS	\$72,239,627	\$40,639,068	\$55,163,183

COSTS	Present-Worth Value	7% Discount	3% Discount
Capital	\$(16,942,297)	\$(16,942,297)	\$(16,942,297)
Maintenance	\$(172,950)	\$(86,194)	\$(125,752)
TOTAL COSTS	\$(17,115,247)	\$(17,028,491)	\$(17,068,049)

Net Present Value (NPV)	\$55,124,381	\$23,610,576	\$38,095,134
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Benefit Costs Ratio	4.22	2.39	3.23
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Project Costs

The proposed Rail-Truck Transload Facility Project is estimated to cost a total of \$16.9 million. The breakdown of the projected costs is included in the BUILD application narrative, BCA spreadsheet and **Table 2** below. These costs include approximately \$2.5 million in previously completed planning and construction phases as well as anticipated construction costs for the Phase 2 improvements. All project costs are anticipated to be expended by the end of 2021. In addition to the upfront capital costs, the project will require maintenance and upkeep. Maintenance costs for the new infrastructure have been included in the BCA calculations based on anticipated maintenance required over a 20-year project life.

All property is currently owned by the Spokane International Airport; therefore, the project will not incur any costs associated with property acquisition or right of way. Total project costs were estimated based on actual costs of projects recently constructed in the region.

TABLE 2 - PROJECT COSTS						
ITEM	SPOKANE INTERNATIONAL AIRPORT	WA STATE LEGISLATURE	WEST PLAINS PDA	BUILD GRANT	COST	BUILD % OF TOTAL COST
Mobilization & Demobilization	\$88,435	\$147,391	\$58,956	\$687,826	\$982,608	70%
Demolition	\$40,360	\$67,267	\$26,907	\$313,912	\$448,446	70%
Storm Drainage & Utilities	\$114,995	\$191,658	\$76,663	\$894,406	\$1,277,723	70%
Railway and Associated Improvements	\$332,310	\$553,850	\$221,540	\$2,584,635	\$3,692,336	70%
Sitework, Surface Features, and Roads	\$508,905	\$848,174	\$339,270	\$3,958,146	\$5,654,495	70%
Transloading Equipment	\$83,143	\$138,572	\$55,429	\$646,669	\$923,813	70%
Design	\$233,416	\$389,026	\$155,610	\$1,815,454	\$2,593,506	70%
Tax	\$123,243	\$205,406	\$82,162	\$958,560	\$1,369,371	70%
TOTAL	\$1,524,807	\$2,541,345	\$1,016,538	\$11,859,608	\$16,942,297	70%

TABLE 3 - NET PRESENT VALUE BENEFITS

MERIT CRITERIA	DESCRIPTION	FACTORS	MONETIZED VALUE	MONETIZED VALUE DISCOUNT RATE (7%)	MONETIZED VALUE DISCOUNT RATE (3%)
Economic Competitiveness	<ul style="list-style-type: none"> Reduction in Truck Travel Time Fuel Cost Savings 	<ul style="list-style-type: none"> 900,000 hours saved in truck travel time 6,600,000 gallons of fuel saved 	\$52,276,096	\$29,629,033	\$40,053,420
Safety	Accident Reduction Savings	<ul style="list-style-type: none"> Accident cost savings due to reduction in truck traffic on I-90 	\$7,214,681	\$3,788,929	\$5,344,679
State of Good Repair	Deferred Maintenance	Maintenance costs for new infrastructure included in construction costs summary.	\$9,066,096	\$5,138,480	\$6,946,352
Environmental Sustainability	Reduce Pollution	<ul style="list-style-type: none"> 65,604 short tons of CO eliminated. 20 short tons of VOC eliminated. 429 short tons of NOx eliminated. 	\$3,682,755	\$2,082,625	\$2,818,733
TOTAL COST			\$(17,133,352)	\$(17,046,596)	\$(17,115,247)
TOTAL BENEFITS			\$30,692,291	\$16,118,651	\$72,239,627
NET PRESENT VALUE			\$13,558,939	\$(927,945)	\$55,124,381
BENEFIT COST RATIO			1.79	0.95	4.22

Project Matrix

A Project Matrix is provided to outline the proposed improvements, impacts, population affected, and economic benefits for the project. See **Table 4** on the following page for the Project Matrix.

CURRENT STATUS	IMPROVEMENTS	IMPACTS	AFFECTED POPULATION	ECONOMIC BENEFITS
Existing freight shipped from downtown rail yard with limited expansion capabilities.	Construct new transload facility in rural area west of City in close proximity to commercial and manufacturing development.	Reduce vehicle accidents, travel times, congestion, emissions, and maintenance. Improve quality of life.	700,000 residents in greater Spokane/CDA metropolitan area. Anticipated 7,000 additional jobs in West Plains PDA.	Monetized value of benefits from improved safety, economic growth, state of good repair and environmental benefits.

Long-Term Benefits

Spokane International Airport Rail-Truck Transload Facility Project meets all BUILD program primary and secondary criteria, as explained in the application and summarized below:

- Improved safety – The project provides an opportunity for freight delivery traffic reduction from the currently used Rail-Truck Transload Facility east of downtown Spokane along I-90 and to the West Plains PDA of the Geiger Blvd. and Medical Lake exits. The area experiences congestion during business hours, which increases the potential for accidents. Reducing the daily freight traffic in the area will help reduce the increasing congestion from the economic growth in the West Plains. Freight movement by rail experiences considerably less accidents than by truck. This is due to the increased potential for accidents on the roadway, making transportation by rail a smarter and safer way to transport the freight in the West Plains for both the citizens living in and around the development area and the businesses investing in the freight delivery.
- Enhanced economic competitiveness – The Rail-Truck Transload Facility Project is a piece of the larger West Plains PDA long-term development plan. The project will support national and regional movement of goods to employment centers and will stimulate economic development for the region. Reduced rail costs for area businesses will allow them to improve practices and expand markets; improving the competitive position of these businesses and enhancing the area’s desirability for further growth and expansion. These efforts that have been articulated in the City of Spokane Comprehensive Plan, the Spokane County Comprehensive Plan, and through the development of the West Plains PDA.
- Increased environmental sustainability – The traffic congestion reduction as a result of localizing distribution of goods, provides reduced congestion related emissions and noise. Utilizing an already built spur line and large tracts of undeveloped land, the Rail-Truck Transload Facility is providing a large economic benefit to area businesses with a small impact to the existing environment. Additionally, movement from truck to rail is more fuel efficient, and produces anywhere from 30% to as little as 8% of the emissions of trucks per ton-mile carried.

- Improved quality of life – The improved quality of life is a cumulative response to the long-term project benefits. Lower emissions, safer roadways, better jobs, reduced maintenance on roadways, reduced congestion, and highly desirable area businesses collectively improve the quality of life in any area. The Rail-Truck Transload Facility will provide an attractive resource for businesses considering relocating to the West Plains areas; increasing opportunities for living wage jobs and future economic expansion.
- Increased regional collaboration – The Rail-Truck Transload Facility is strongly supported by a broad range of partners, including: Spokane County, City of Spokane, SIA, and the West Plains PDA.
- Leveraged regional partnerships – The Rail-Truck Transload Facility is regionally significant in a rural setting. Project partners are invested in economic development in the West Plains area and within Spokane International Airport lands.

Benefits

Safety

A reduction in collision injuries and fatalities is one of the benefits of the Spokane International Airport Rail-Truck Transload Facility Project. The Rail-Truck Transload Facility will provide a reduction in freight traffic along I-90 to and from downtown Spokane resulting in the safe movement of goods and a reduction in vehicle crashes and injuries. Freight will be delivered to the Rail-Truck Transload Facility via the rail line, providing a local area to transport freight to and from the businesses located in the West Plains. The potential over-sized loads will stay off the I-90 corridor and exits, providing a less congested and safer transportation system. Proposed infrastructure is estimated to reduce accidents by about 1.6%, which may reduce costs associated with health and property damage. Injury and fatality numbers used for this calculation were drawn from the 2018 I-90 Operations Study.

Factors		
I-90 Average Daily Traffic	100,000	2018 I-90 Operations Study
I-90 Average Daily Freight Traffic	25,000	2018 I-90 Operations Study
Annual rate of Traffic Growth	3.50%	2018 I-90 Operations Study
Collision Reduction Factor	1.60%	400 daily Freight truck operations converted to rail.

KABCO Level	2011-2015	Total per Injury Type	Value per Injury Type	Value of Injuries
O-No Injury	1930	1930	\$3,200	\$6,176,000
C-Possible Injury	449	449	\$63,900	\$28,691,100
B-Non-incapacitating		0	\$125,000	\$0.00
A-Incapacitating	10	10	\$459,100	\$4,591,000
K-Killed	3	3	\$9,600,000	\$28,800,000
U-Injured (Severity Unknown)		0	\$174,000	\$0.00
Injury Unknown		0	\$132,200	\$0.00
Total	2392	2392		\$68,258,100

The accident reduction assumption is a direct correlation to the number of trucks anticipated to be removed from I-90 (400 trucks per day) compared to the average daily freight traffic (25,000 trucks per day). The reduction in injuries and fatalities benefit is estimated to be \$255,119 per year, beginning in 2022 and continuing for 20 years. The present value of the safety benefit is \$7,214,681 and \$3,788,929 at a 7 percent discount rate. Calculations can be found in the "Accident Savings" tab of the supporting Excel spreadsheet.

Travel Costs

Benefits from a reduction in travel costs are primarily associated with reduced truck travel times, fuel usage, and emissions savings for daily truck traffic. The Rail-Truck Transload Facility will provide more efficient access and delivery of freight to this area. Trucks accessing the site will no longer be required to operate on I-90 to and from the Spokane Valley facility. Round trip distance from the existing downtown rail facility to the West Plains PDA is estimated at 26-miles.

Assumptions		
Travel Time Savings	2080	Seconds.
Travel Speed	45	MPH
Commercial Truck Hourly Value	\$28.60	2018 USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs
Locomotive Engineer Hourly Value	\$44.90	2018 USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs
Work Days per year	261	

Traffic growth		
Facility Capacity (Rail)	100	rail containers per day
Conversion factor to Trucks	4	trucks/rail container
Facility Capacity (Trucks)	400	freight trucks/day
Growth per year	0.0%	Assumes full capacity
Distance savings	26.0	Miles/Traffic Operation

Over the 20-year project life, the Rail-Truck Transload Facility will reduce truck travel distance by 35 minutes per delivery, with a daily impacted truck traffic of 104,400 per year, providing a total 20-year travel time cost savings of \$34,232,203 and \$19,402,120 at a 7 percent discount rate.

At an average price of \$3.04 per gallon of gasoline, the Rail-Truck Transload Facility will save an estimated \$17,773,056 over the 20-year project life, \$9,414,400 at a 7% discount rate. The first year of the project saves \$830,517 at a 7% discount rate.

Vehicle Use Assumptions		
Average price of gasoline per gallon	\$3.04	http://fuelgaugereport.aaa.com/
Assumed impacted one-way trips per day	2	
Days per year	365	
Average truck miles traveled per gallon of fuel consumed	6.5	http://www.popularmechanics.com/cars/trucks/g116/10-things-you-didnt-know-about-semi-trucks/
Rail Fuel usage equal to 1/3 of trucks per ton-mile.		

Calculations can be found in the “Travel Time” and “Fuel Savings” tabs of the supporting Excel spreadsheet.

Emissions Reductions

The 2.7 million truck miles removed from the road each year would remove a substantial volume of pollutants from the air as well, with an estimated net emissions reduction over the 20-year life of the project at 60,000 tons of CO, CO₂, NO_x, SO_x, volatile organic compounds, and particulate matter. Overall emissions reductions have been calculated for nitrogen oxides (NO_x), Carbon dioxide (CO₂) and Volatile Organic Compounds (VOCs) based on the 2018 Benefit-Cost Analysis Guidance for Discretionary Grant Programs.

References			Source
	Grams/Ton	Units	
VOC	21.8	\$2,000	2018 Benefit-Cost Analysis Guidance for Discretionary Grant Programs, Appendix A Table A-6.
NOx grams/hour	461	\$8,300	
1 gram = .000001 metric tons	1.10231E-06		
CO2	0.0101800	metric tons of CO2/gallon of diesel	https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references

Emission reductions were calculated by comparing emissions reductions from trucks against the increase in emissions associated with the additional rail traffic. Truck emissions were based on a daily reduction in 400 trucks operating 26-miles round trip from the existing downtown rail yard to the businesses located in the West Plains PDA.

Based on this assumption, 400 trucks per day over a 20-year project life would produce an estimated 85,600 tons of pollutants.

Rail produces a fraction of the emissions per ton-mile as truck. It was assumed that rail operations would produce only 30% of emissions produced by trucks per ton-mile. The increase in rail travel as a result of the Rail-Truck Transload Facility therefore resulted in an estimated 25,600 tons of pollutants over the 20-year life of the project.

Approximately 20 Short Tons of VOCs, 429 Short Tons of NOx, and 65,600 Short Tons of CO will be removed from the environment over the life of the project. These reductions equal \$3,682,755 in present worth dollars or \$2,082,625 at a 7% discount rate.

State of Good Repair

Estimated reduced highway maintenance costs, presented as deferred damage to the roadway due to a decrease of freight truck traffic, is \$130,761 in year 2022, increasing to \$251,388 in year 2041, for a total of \$3,679,879 over the 20-year project life, at a 7% discount rate this equates to \$1,814,965. This number was derived from the 1997 Federal Highway Cost Allocation Study Final Report, May 2000, which estimates high damage from freight trucks at \$0.167 per mile. This calculation also includes an assumption of a 12-mile reduction in daily travel distance per truck.

Highway Pavement Damage Factors		
Estimated Highway Damage from freight trucks per mile	\$0.167	Addendum to the 1997 Federal Highway Cost Allocation Study Final Report, FHWA, May 2000
Average travel reduction in miles	26	Reduction in one-way trip distance from Port of Tacoma to transload facility.

Unquantified Benefits

Additional Economic Benefits

This facility once operational will have the impact to reduce truck traffic operating across the State of Washington, primarily on Interstate 90, associated with the shipment of freight for our nation's seaports on the west coast. By providing improvements to the rail system businesses will have a more efficient, economic means of shipping freight to the region resulting in less demand for truck traffic.

The greater Spokane Metropolitan region currently relies mainly on truck transport for the delivery of goods and freight. Rail service across the Cascade Mountains, located between Seattle and Spokane, is much more reliable than truck transport during the winter months. A 2008 Freight Transportation Economic Impact Assessment Report concluded that lack of reliability and closures to I-90 due to mountain passes and winter weather resulted in nearly \$28 million lost revenue to the state's economy over one winter. In short; congestion and reliability in the project area affects the entire region's ability to foster reliable and cost-effective transportation services for potential businesses.

This reduction in truck traffic will equate to additional benefits in emissions reductions, travel time, fuel costs, deferred maintenance on highways, and accidents not calculated in this analysis.

Quality of Life

The project will promote the economic development of the region providing additional jobs to residents and promoting growth of the region. Further, the planned development of the West Plains PDA as a world class transportation, logistics, and advanced manufacturing center with a focus on the aerospace industry is anticipated to result in better than average wages with positions associated with engineering, science, manufacturing, information technology and project management.

Enhanced Property Values

The proposed project will increase the efficiency and safety of the multimodal transportation system currently operating along the corridor. While this analysis does not estimate enhanced property value for existing and likely new development that would occur because of the BUILD projects, it is anticipated that it will generate significant property value benefits.

Studies have shown that the commercial and industrial parks in and around the Spokane International Airport are seeing increased growth and development over the last decade. The project will provide access to a large majority of the available development land part of this growth and development. Improvements to the access corridor will not only expedite the regions development but will result in increased property values for the area.

Increase Resiliency of Trade Corridors

Studies have shown that the commercial and industrial parks in and around the Spokane International Airport are seeing increased growth and development over the last decade. The project will provide access to a large majority of the available development land part of this growth and development. Improvements to the access corridor will not only expedite the regions development but will result in increased property values for the area.